

RESPONSE TO RWQCB COMMENTS OF 10 JUNE 2004 ON:

**Remedial Action Work Plan (RAWP) & 90% Design Report for Soil Remediation,
Olin/Standard Fusee Site, Morgan Hill California
(GeoSyntec; 8 April 2004)**

Introduction

This document provides responses to comments on the subject Remedial Action Work Plan (RAWP) by the California Regional Water Quality Control Board (RWQCB), Central Coast Region, in their letter of 10 June 2004. RWQCB discussion items/comments are provided below in bold italics, and followed by Olin's responses.

1. ***RWCQB Comment: The addition of bromide, a conservative tracer, within the TSA is recognized as a useful method in determining vadose zone and groundwater flow patterns. We recommend, based on previous site investigations in the Central Coast Region, that background sampling for bromide be conducted prior to application. This may aid in determining if your tracer results are acceptable and accurate.***

Olin Response: Although not explicitly stated in the RAWP, baseline sampling of bromide is a standard practice for bromide tracer studies, and accordingly, baseline samples will be collected and included as part of the overall analysis. Of note, bromide data for soils and groundwater have been previously collected, and were reported in Tables 2-4 and 2-5 of the Soil Remediation Feasibility Study (GeoSyntec; 21 November 2003). Bromide concentrations in soil samples from former buildings 5, 11 and 14, located within the Target Soil Area (TSA), ranged from <10 to 20 mg/kg. Bromide concentrations in synthetic leachate produced from these soils ranged from 0.43 to <3 mg/L. Bromide concentrations in A-zone groundwater are typically less than 0.7 mg/L. Therefore, background bromide should not adversely impact our ability to monitor bromide in pore water/groundwater.

2. ***RWCQB Comment: The RAWP mentions that Olin may, at a later date, request an increase in the site soil remediation goal of 50 µg/kg. As we understand, your potential request would be based on DHS Action Level change from 4 ppb to 6 ppb. While it may appear appropriate to change the remediation goal based on the DHS action level change, we are not inclined to do so. Ideally, the perchlorate soil remediation goal should be reflective of achieving background groundwater conditions, which is 0 ppb and not 4 ppb. However, since the most reasonable achievable detection limit for perchlorate is 4 ppb, staff is using that as its groundwater protection basis. This shall not be construed as groundwater cleanup level, rather, it should be viewed a basis for moving remediation forward. Therefore, Regional Board staff will only consider approving a lower soil***

remediation goal at this time, unless the Regional Board approves a groundwater remediation goal higher than 4 ppb.

Olin Response: As indicated in Olin 10 February 2004 letter to the RWQCB, the site-specific remediation goal of 50 ppb perchlorate, established in Appendix C of the "Soil Remediation Feasibility Study" report (GeoSyntec, 11/03), was based upon the then current DHS action level of 4 ppb (page 2 of the Soil Screening Level report). On 11 March 2004 however, the California Office of Environmental Health Hazard Assessment (OEHHA) established a Public Health Goal (PHG) of 6 ppb for perchlorate. As indicated in a 12 March 2004 OEHHA memorandum from Joan E Denton, Ph.D. to Terry Tamminen, California Environmental Protection Agency, "The support document [for establishment of the 6 ppb PHG] estimates the level of chemical in drinking water that would pose *no* significant health risk to individuals, including sensitive populations, consuming the water on a daily basis over a lifetime (emphasis added)." Concurrent with OEHHA's establishment of the 6 ppb PHG, the DHS revised their AL to 6 ppb.

Although an MCL has not yet been established for perchlorate and both OEHHA and DHS have established a health-based goal of 6 ppb, Olin will implement the Soil Remediation Work Plan recognizing the Site-specific remediation goal of 50 ppb as an *interim goal* for soil remediation based on the outdated 4 ppb AL. If an MCL is established that is different than 4 ppb, Olin will request a revision to the interim remediation goal of 50 ppb in soil.

3. ***RWCQB Comment: Olin is proposing to collect soil samples to determine the effectiveness of in situ and ex situ anaerobic bioremediation. The proposed soil sampling program for in situ bioremediation will analyze perchlorate, bromide, and acetate at 24 sample locations across the target soil area (TSA) yearly. Soil will be sampled using direct push technology and following sampling, the 16 ft soil core samples will be homogenized and analyzed for perchlorate. We have several concerns with the proposed sampling and analysis plan including:***

Olin Comment: The objective of the soil sampling program is to determine whether or not the 95 percent upper confidence limit (UCL_{95}) of the arithmetic mean perchlorate concentration in the treatment area soils is less than 50 $\mu\text{g}/\text{kg}$ (the remediation goal) following in situ bioremediation. The sampling strategy is designed specifically for this objective, and as such, it is statistically defensible and technically sound. By comparison, the sampling program requested/advocated in many of the following RWQCB comments would introduce statistical bias, and would not be technically sound for addressing the stated objective. Specifically, re-locating a higher percentage of sample locations to areas having elevated baseline concentrations introduces a statistical bias that does not accurately reflect the true arithmetic mean perchlorate concentration of the entire soil volume in the TSA. Similarly collecting discrete depth samples, and/or assessing concentrations based on lithology may bias the arithmetic mean in a manner that is not in proportion to the

volume of soil being treated. Responses for the individual RWQCB comments are provided below.

- a. *The RAWP does not contain any provision for pre-remediation sampling to establish baseline concentrations. While some of the soil borings will be advanced in areas with numerous soil-boring data, some areas have little data. Additionally, eight of the locations are outside of the TSA 50 ug/kg concentration contour. Regional Board staff acknowledges that this line demarcates an approximated 50 ug/kg area limit. However, these locations could already be below 50 ug/kg, which will not aid Olin in determining if soil remediation is effective on affected soils. Therefore, Regional Board staff requests that pre-remediation soil sampling be conducted at all proposed soil boring locations to establish baseline concentrations.*

Olin Response: Approximately 650 soil samples from more than 200 locations have been collected at the site over the past 18 months, which is sufficient for baseline characterization of the TSA. As noted above, the remedial goal is to determine whether or not the UCL_{95} of the arithmetic mean perchlorate concentration in the TSA soils is less than 50 $\mu\text{g}/\text{kg}$ following in situ bioremediation. The in situ bioremediation remedy will promote infiltration of water and electron donor, which will result in re-distribution and biodegradation of perchlorate within the TSA/infiltration Unit. As a result, comparing pre- and post-bioremediation perchlorate data at discrete locations is inappropriate.

- b. *There are two areas with elevated concentrations of perchlorate that have confirmation soil borings situated in either outside the 50 ug/kg area or are just inside. The attached figure shows the locations of these two areas. Regional Board staff requests that a sample boring be located in the middle of these areas. Our request is based on the fact that confirmation soil borings are located in high concentration areas, and the goal of soil sampling plan should not merely be to set up a random sampling grid, but to also confirm that area with high concentrations are remediated.*

Olin Response: The purpose of the sampling grid is not to avoid areas that have higher starting perchlorate concentrations, but to sample them at a frequency that is proportional to their areal extent. This ensures that these areas are weighted appropriately in determining the statistical distribution of perchlorate (i.e. normal, lognormal, non-parametric, etc.) and in calculating the mean concentration and UCL_{95} . That said, Olin will revise the grid orientation to include sample locations within the two areas identified in the Figure attached to the 10 June 2004 letter.

- c. *The approach will not allow for measurement of potentially stratified perchlorate concentrations, and may miss areas of high concentrations.*

Homogenizing a 16 ft soil core may lead to a dilution of perchlorate soil concentrations that are contained in finer grain soils. At a minimum samples shall be collected at 0-1, 1-5, 5-10, and 10-15 depths to directly compare pre-to post-remediation soil concentrations.

Olin Response: The purpose of obtaining a representative sample by passing the entire soil core through a riffle splitter until a representative (including grain size distribution) 250 gram split is not to “dilute” potential isolated high-perchlorate layers. Instead, this method ensures that any such layer will be included in the sample proportional to its volumetric extent, in contrast to a biased depth interval subsample approach.

- d. The RAWP proposes utilizing a 95% upper confidence limit (UCL) for soil testing. This statistical method for soil sampling is based on modeling the soil as a single population. However, the potential variety of soil types at each sampling locations could lead to inappropriate application of this statistical method. We request that you address the appropriateness of using the UCL with soil populations that are not identical.***

Olin Response: The objective of the soil sampling program is to determine whether or not the UCL₉₅ of the arithmetic mean perchlorate concentration of the entire soil volume (i.e., entire population) is less than 50 µg/kg following in situ bioremediation. The sampling strategy is therefore designed to weight any subpopulation, however defined, on the basis of its proportional contribution to the entire population. Homogenizing entire core samples until a representative sample is obtained will ensure that the impact of any subpopulation (e.g., soil type) will be accurately reflected proportional to its volumetric extent.

- 4. RWCQB Comment: According to the excavation plan detailed in the process description, soils containing perchlorate above 7,800 µg/kg will be excavated and bioremediated onsite. The RAWP did not include a plan to verify that soil above 7,800 µg/kg would be fully removed. To ensure complete excavation of soils above 7,800 µg/kg, we request that bottom and sidewalls soil samples be collected to confirm that perchlorate-contaminated soil above 7,800 µg/kg is removed. A proposal with the number and location of confirmation sampling shall be provided to the Regional Board by 30 June 2004.***

Olin Response: Approximately 650 soil samples from more than 200 locations have been collected at the site over the past 18 months, a significant number of which were collected within the area targeted for excavation (see Figures 2-4a through 2-4d of the RAWP). Of the approximately 650 soil samples, 6 of the samples contained perchlorate above 7,800 µg/kg; 4 samples in the 0-1 ft interval (DP-B05-032, DP-B05-043, DP-B05-045, and SWS-009) and 2 samples from a depth of 5 ft (DP-B05-030 and SWS-009). Samples DP-B05-032, DP-B05-043, and DP-B05-045 are

bounded laterally (@ 0-1 ft) and vertically (@ 5 ft and deeper) by multiple samples below 7,800 µg/kg. Samples DP-B05-030 and SWS-009 are bounded laterally (@ 5 ft) and vertically (@ 10 ft and 15 ft) by multiple samples below 7,800 µg/kg. The high density of sampling in the targeted area clearly defines the soil above 7,800 µg/kg. The excavation design is highly conservative as it encompasses numerous soil samples below 7,800 µg/kg. Given the high density of soil data and the highly conservative nature of the excavation area and depth, confirmation sampling is superfluous.

It should be noted that confirmation sampling is typically employed when excavation and subsequent treatment is the final treatment for an area. In this case, in situ bioremediation will be applied to the TSA (including the excavation area) immediately following completion of ex situ bioremediation, and would be expected to treat any perchlorate not initially treated by the excavation and composting. Furthermore, the groundwater extraction and perchlorate removal system contains groundwater beneath the targeted excavation area. Considering these two factors, in addition to the conservative nature of the excavation, Olin will proceed with the excavation program proceed as described in the RAWP (e.g., excavation to pre-surveyed, conservative cut lines).

- 5. RWCQB Comment: Infiltration Unit construction is not proposed near the TSA southern extent. This is related to concerns regarding infiltration to and flooding of a nearby utility trench. Regional Board staff is concerned that this area will remain a source of perchlorate long after remediation ends. Since this area cannot be treated, plans to excavate and treat the soil may be appropriate. We ask that you address this and or other options for treatment.***

Olin Response: Given the presence of the utility trench containing the groundwater extraction conveyance pipes & electrical wiring, the risks associated with excavation in the TSA southern extent are significant. Therefore, instead of excavation in this area, Olin will add calcium magnesium acetate (CMA) to the surface soils in this area to enhance biodegradation of the small amount of perchlorate present in this area. The rate of application will be consistent with the application rate of the Infiltration Unit conditioning steps. Following application, the target area will be wetted with appropriate equipment at a rate that will not foster runoff or significant drainage through the utility trenches. The application of water will dissolve the CMA and will establish conditions conducive to perchlorate biodegradation within the soil. This approach is considered appropriate given the small mass of perchlorate in the target area (i.e., less than 1% of the total mass of perchlorate in the soil) and the presence of the groundwater extraction and treatment system that provides hydraulic containment of groundwater underlying the target area.

- 6. RWCQB Comment: Our February 9, 2004 letter requested a RAWP soil and groundwater performance monitoring plan. The RAWP outlines your plans to install two additional shallow (0-15') wells, ten soil moisture sensors, and 10 soil***

lysimeters around and within the soil TSA. We are still concerned with the potential for lateral migration of perchlorate and or substrate. Rather than require additional shallow wells (0-15') we request that additional soil moisture sensors be installed. We believe that this will provide an early indication of lateral migration and will provide time to: adjust the treatment system and allow for shall well and or lysimeter installation. We request that a soil moisture sensor be placed adjacent to each infiltration zone, including at the ends of the TSA. These probes shall be in place prior to TSA operation.

Olin Response: As described in Section 3.4.4 of the RAWP, system start-up and optimization will be conducted for a period of 3 to 4 months to develop an initial appreciation of system operations and infiltration behavior. During the start-up and optimization period, performance monitoring will be conducted with increased frequency, to evaluate the adequacy of the operational approach, and modifications to the operating strategy and/or performance monitoring network will be enacted if the performance monitoring supports such actions.